IN THE DRAWINGS

A proposed change to Fig. 6 is submitted herewith along with a Submission of Proposed Drawing Amendments.

REMARKS

Reconsideration and allowance are respectfully requested in light of the above amendments and the following remarks.

In response to Section 1 of the office action, a revised Fig. 6 labeled as "related art" is submitted herewith along with a Submission of Proposed Drawing Amendments.

The claims have been amended to highlight patentable features of the present invention. Support for the amended claims is found in at least the original claims, Fig. 3 and the related description of Fig. 3 at page 13, line 17 through page 17, line 24. Page 17, lines 10-16 specifically describes the conductor-buried regions 11, 14 and 18 as being formed by a plugging procedure.

Claims 13-15 have been amended to overcome the objections in section 2 of the office action. It is submitted that the amended and new claims overcome the rejection under 35 USC 112, second paragraph. Also, the revised claims overcome the comments in the office action concerning product-by-process limitations.

No new matter is added by any of these amendments.

Claims 1, 4, 7, 10 and 13 stand rejected under 35 USC 102(b) as anticipated by Ito (JP 2002-280536). Claims 2, 3, 5, 6, 8, 9, 11, 12 and 15 stand rejected under 35 USC 103(a) as unpatentable over Ito (JP 2002-280536) in view of Takimoto (USPN 6,380,603).

To the extent that these rejections may be applied to the amended and new claims presented herein, the Applicants respectfully traverse based on the points set forth below.

The present invention is directed to providing an optical semiconductor device capable of improving the frequency characteristics of its light-receiving elements through reduction in parasitic capacitance and series resistance. With the present invention, because parasitic capacitance is reduced by isolating the light-receiving region constituting the light-receiving element from the plug using an isolation region made of an insulator or a dielectric, the frequency characteristics of the light-receiving element can be improved. Further, because series resistance can be reduced by electrically connecting the electrode and the semiconductor region of the first conductivity type constituting the light-receiving element using the plug made of a conductor and passing through the isolation region, the frequency characteristics of the light-receiving element can be improved further. As a result, according to the formula $f=2\pi/RC$ (where R is a series resistance and C is a parasitic capacitance) which determines the frequency characteristics of the light-receiving element, the frequency characteristics of the light-receiving element can be synergistically improved by

reducing not only the parasitic capacitance but also the series resistance.

Ito (JP 2002-280536) discloses in Figs. 1, 3 and 5 (cited in the office action) an optical semiconductor device which includes a light-receiving element region 1 having an N-type semiconductor layer 3 formed on a P-type semiconductor substrate 2. A plurality of light-receiving elements are formed of the semiconductor substrate 2 and the semiconductor layer 3. A LOCOS film 6 is formed by thermally oxidizing semiconductor layer 3 selectively so as to isolate the plurality of light-receiving elements from one another. A P+-type anode-leading region 13 is selectively formed in the semiconductor layer 3. A P+-type anode contacting region 14 is formed on anode-leading region 13. An anode electrode 15 is formed on anode contacting region 14. From this, it is apparent that anode-leading region 13 and anode contacting region 14 are both P+-type impurity diffused layers formed in the N-type semiconductor layer 3 on the P-type semiconductor substrate 2 (see paragraph [0024]). In other words, Ito's anode-leading region 13 and anode contacting region 14 are semiconductor regions. In this regard, it is noted that the office action erroneously asserts that anode-leading region 13 and anode contacting region 14 are polysilicon or tungsten.

The Applicants note that this is incorrect and is a misinterpretation of the reference.

Takimoto (USPN 6,380,603) has been cited for an alleged disclosure of an optical semiconductor device including a contact portion formed by burying a conductor 4/8 in the opening and surrounding each light-receiving element 7. However, the Applicants note that element 4/8 of Takimoto comprises a P+ type embedded diffusion layer 8 and a P+ type separation diffusion layer 4, and layers 4 and 8 constitute a device isolation region 4' (see col. 7, lines 23-28). In addition, because device isolation region 4' (4,8) is used for electrically connecting the P+ type semiconductor layer 2 and anode electrode 15, the element separation section and the electrical connection section are the same. Therefore, the light-receiving element section cannot be separated from the electrical connection section, and the electrical connection section cannot extend beyond the element separation section.

In contrast to both Ito and Takimoto, present claim 1 recites a plug formed of a conductor which extends through the isolation region and contacts the semiconductor region of the first conductivity type in order to electrically connect the electrode and the semiconductor region of the first conductivity type, wherein the plug extends into the semiconductor region of

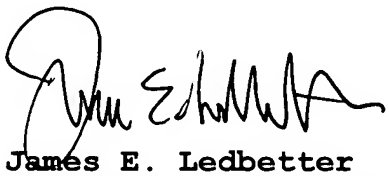
the first conductivity type beyond the isolation region. Therefore, the plug formed of a conductor of present claim 1 differs from the semiconductor region of Ito and the configuration of the element separation section of Takimoto. Also, because of the feature in which the plug conductor of claim 1 extends into the P-typ anode region beyond the isolation region made of an insulator or a dielectric, the frequency characteristics of the light-receiving element are improved by reducing both the parasitic capacitance and the series resistance of the plug of the light-receiving element. Neither of Ito and Takimoto are capable of achieving this effect.

As a result of at least the above-noted differences from Ito and Takimoto with respect to structural configuration and advantages flowing therefrom, it is submitted that Ito and Takimoto, considered alone or together, fail to anticipate or render obvious the subject matter of present claim 1. Claims 2-17 are considered to be allowable due to their dependence from allowable claim 1 and also due to their recitation of subject matter that provides an independent basis for their individual allowability.

Accordingly, in light of the foregoing, it is submitted that all pending claims are directed to allowable subject matter, and a notice of allowance is respectfully requested.

If any issues remain which may best be resolved through a telephone communication, the examiner is requested to telephone the undersigned at the local Washington, D.C. telephone number listed below.

Respectfully submitted,



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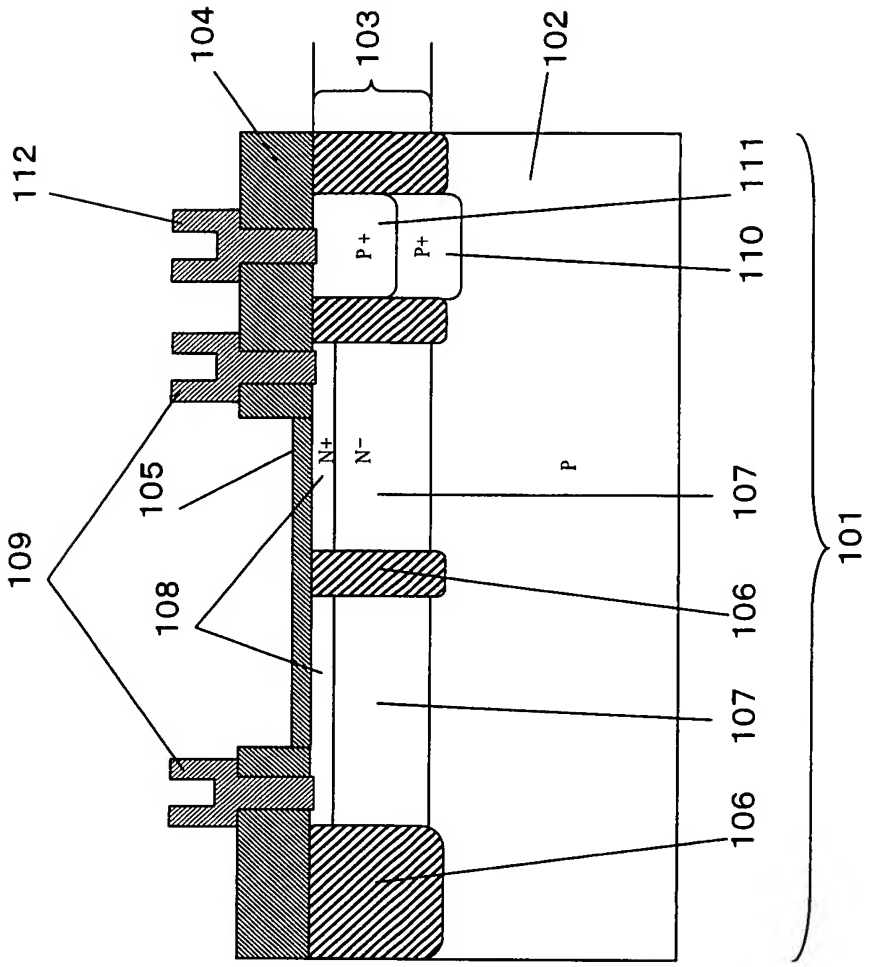
MARKED UP SHEET

Fig. 6



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